# THE MICROPROCESSORS & MICROCONTROLLERS

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# PRACTICE EXERCISE #1:

**ACQUAINTANCE WITH PROTEUS AND THE 8051 MICROCONTROLLER FAMILY**

## Student preparation

* + Knowledge of Assembly programming on 8051. Download and preview “Assembly instruction set of 8051".
  + Download and install Proteus software version 8.6.

## Practice content (4 points)

1. Design a heart-led circuit consisting of 32 LEDs controlled by AT89C51. **(2 points)**
2. Build an Assembly program so that the circuit can run continuously with at least 3 effects, each effect runs within 5 seconds. **(3 points)**

* A heart shaped diagram with red dots and green lines

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## Exercises

Research and write the steps of printed circuits from the design step on the proteus to the step of completing the printed circuit in practice.

## Report (6 points)

**Compress design files and report files into a file named as follows: [<LAB...>]-[<Student code>]-Full name**

The required report file contains the following contents:

1. Design result (screenshot and pasted in the report). **(1 point)**

A heart shaped diagram with red dots and green lines

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1. Explain the operating principle of the effects, accompanied by a video (send a Google Drive link) to demonstrate the circuit operation in case the instructor cannot run the design file. **(3 points)**

**https://drive.google.com/file/d/1LswLI8LhO3FtEedI-LMEK\_Uk388hEyCt/view?usp=drive\_link**

1. Presentation of the steps to implement the printed circuit. **(2 points)**

* Overall of the heart 32led design: Design the heart 32led that display at least 3 effects which can help us organize the principles of microcontroller.

1. First step (draw the designed circuit)

* I used the AT89C51 microcontroller to help me with this problem. I have these components list below:

+ AT89C51

+ VCC

+ 32LED which placed like a heart

+ 32 Resistor

* The problem of resistor is we have to calculate the separate resistor to make the led on or off, so we take example of 1 led and 1 resistor.
* With 1 led, I can see the electric current is 10mA and forward voltage is 2.2V

A white rectangular object with a black border

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* With this information and we have already known that VCC store 5V itself. Thus, we have come to this equation:

Vcc = Ur + Uled

⬄ 5V = 10mA.R + 2,2V

⬄ R = 280 (Ω)

* We had enough information to design the circuit, next step is placed and wired the component together. With the problem of wiring component, note that the anode(-) will wired with 1 of the AT89C51 ports and the cathode(+) will wired with the VCC through resistor. In this designed I have placed the number of led anticlockwise (P0->P2->P3->P1 on the microcontroller).

1. Coding section with Asm

In this section, I will presentation the code of each effect I have done (watch video first).

* Delay function:

A screen shot of a computer program

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* With this delay function, I will make the time of displaying each effect based on the #data (150) increase it will make the time of displaying longer.

**Subprogram 1**

A screenshot of a computer program

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* With this first subprogram, I wanted to make the led turn off anticlockwise. Firstly, I made the 32led all lighten up and looping through 4 function loops to make it turn off.

**Subprogram 2 (the blinking led)**

A screenshot of a computer program

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* Like the name of the subprogram, all 32leds will blinking 5 times with the flag (R7), it will turn on and off continuously.

**Subprogram 3**

A screenshot of a computer program

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* This effect actually have 2 program in it, but I have grouped it to 1 subprogram.
* With this effect, I wanted to make the led turn off like the video I have provided. So the loop6 have presentation the anticlockwise turn off (by the code RLC A), the loop7 will turn off clockwise( by the code RRC A).

**Subprogram 4**

A screenshot of a computer program

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* In this effect, the led will be turned on and off based on what state it has. Take a look, with P0 on the first, it turned on so the P0 after will off as long as the other one. This effect has 5 times to demonstrate.